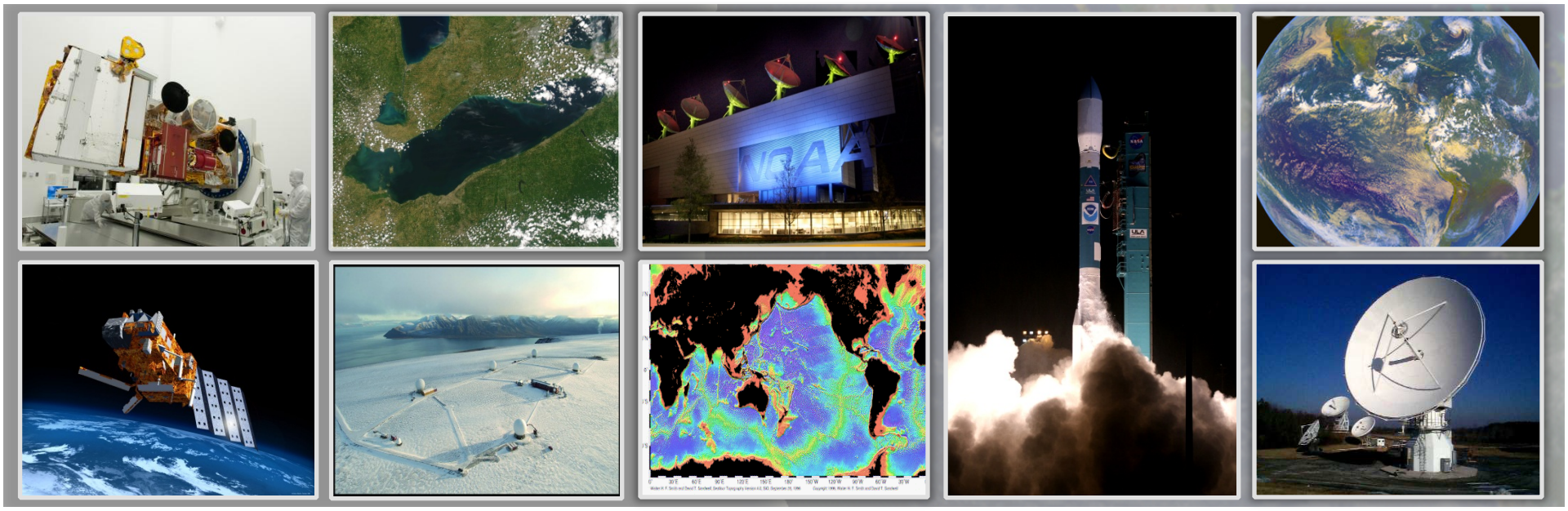
Joint Polar Satellite System (JPSS) Proving Ground



Mitch Goldberg,
Acting JPSS Program Scientist
JPSS Proving Ground Chair

Bill Sjoberg, Program Support Lead

Ingrid Guch, NOAA/STAR
JPSS Proving Ground Co-Chair

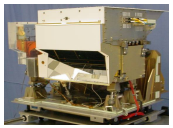
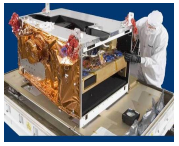
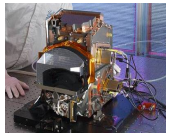
John Furgerson, JPSS
Training and User Liaison

Overview

- NPP Sensors and contribution to NOAA mission
- Proving Ground and Risk Reduction for JPSS

SUCCESSFUL LAUNCH October 28, 2011

NPP/JPSS Science Instruments

NPP/JPSS Instrument		NOAA Mission Benefits
	ATMS	ATMS and CrIS together provide high vertical resolution **temperature** and **water vapor information needed to maintain and improve forecast skill** out to 5 to 7 days in advance for extreme weather events, including hurricanes and severe weather outbreaks
	CrIS	
	VIIRS	VIIRS provides many **critical imagery products** including snow/ice cover, clouds, fog, aerosols, fire, smoke plumes, vegetation health, phytoplankton abundance/chlorophyll. All are required for environmental hazard monitoring and are useful for crucial economic sectors (transportation, fishing, energy, agriculture), all of which impact human health
	OMPS	Total ozone for **monitoring ozone** hole and recovery of stratospheric ozone and for UV index forecasts
	CERES/TSIS	Provide **climate quality measurements** of the Earth's outgoing radiation budget- longwave infrared, reflected solar flux, and incoming solar radiation, all of which are vital to climate monitoring

JPSS L1RD Products

VIIRS (22)

- ALBEDO (SURFACE)
- CLOUD BASE HEIGHT
- CLOUD COVER/LAYERS
- CLOUD EFFECTIVE PART SIZE
- CLOUD OPTICAL THICKNESS
- CLOUD TOP HEIGHT
- CLOUD TOP PRESSURE
- CLOUD TOP TEMPERATURE
- ICE SURFACE TEMPERATURE
- NET HEAT FLUX
- OCEAN COLOR/ CHLOROPHYLL
- SUSPENDED MATTER
- VEGETATION INDEX
- AEROSOL OPTICAL THICKNESS
- AEROSOL PARTICLE SIZE
- ACTIVE FIRES
- IMAGERY
- SEA ICE CHARACTERIZATION
- SNOW COVER
- SEA SURFACE TEMPERATURE
- LAND SURFACE TEMP
- SURFACE TYPE

ESPC GCOM AMSR-2 (11)

- CLOUD LIQUID WATER
- PRECIPITATION TYPE/RATE
- PRECIPITABLE WATER
- SEA SURFACE WINDS SPEED
- SOIL MOISTURE
- SNOW WATER EQUIVALENT
- IMAGERY
- SEA ICE CHARACTERIZATION
- SNOW COVER/DEPTH
- SEA SURFACE TEMPERATURE
- SURFACE TYPE

OMPS (2)

- O_3 TOTAL COLUMN
- O_3 NADIR PROFILE

CERES (4)*

- DOWN LW RADIATION (SFC)
- DOWN SW RADIATION (SFC)
- NET SOLAR RADIATION (TOA)
- OUTGOING LW RADIATION (TOA)

CrIS/ATMS (3)

- ATM VERT MOIST PROFILE
- ATM VERT TEMP PROFILE
- PRESSURE (SURFACE/ PROFILE)

A-DCS

TSIS (1)

SOLAR IRRADIANCE

SARR & SARP

KEY

- EDRs with Key Performance Parameters
- JPSS-1
- GCOM
- JPSS Program (Host TBD)

Challenge

- Move from Products to Applications
- Ensure users are ready for NPP/JPSS data and improve their key operational and research product and services
  - ✓ Severe weather forecasts and warnings
  - ✓ Aviation weather forecasts and warnings
  - ✓ Improve fire and air quality forecasts and warnings
  - ✓ Improve warnings and prediction of poor water quality in coastal regions
  - ✓ Improve drought, precipitation, snow and ice assessments and predictions
- Periodic feedback from keys users on the impact of NPP/JPSS data and to identify improvements needed for products and applications

Proving Ground & Risk Reduction for JPSS

- The JPSS Proving Ground and Risk Reduction program's primary objective is to maximize the benefits and performance of NPP/JPSS data, algorithms, and products for downstream operational and research users (gateways to the public) through:
    - Detailed characterization of data attributes such as uncertainty (accuracy and precision) and long-term stability
    - Engaging users to enhance their applications by working together to facilitate optimal utilization of JPSS data, algorithms and products in combination with other data sources through onsite/offsite testbeds, experimental data streams, and intercomparisons of enhancements with baselines
    - Education, Training and Outreach
    - Facilitating transition of improvements (new algorithms/applications) to operations.

PGRR Application Areas

- Cal/Val Applications
- Tropical Cyclone Applications
- Cryosphere Applications
- Severe Weather/Aviation Applications
- Ocean/Coastal Applications (Coral Bleaching, Harmful Algle Bloom alerts)
- Land Applications (Agriculture, Droughts)
- Hazard Applications (Smoke, Fire, Aerosols, Air Quality, Flash Floods)
- Data Assimilation Applications
- Imagery/Visualization Applications
- Climate Applications

JPSS Proving Ground Summary

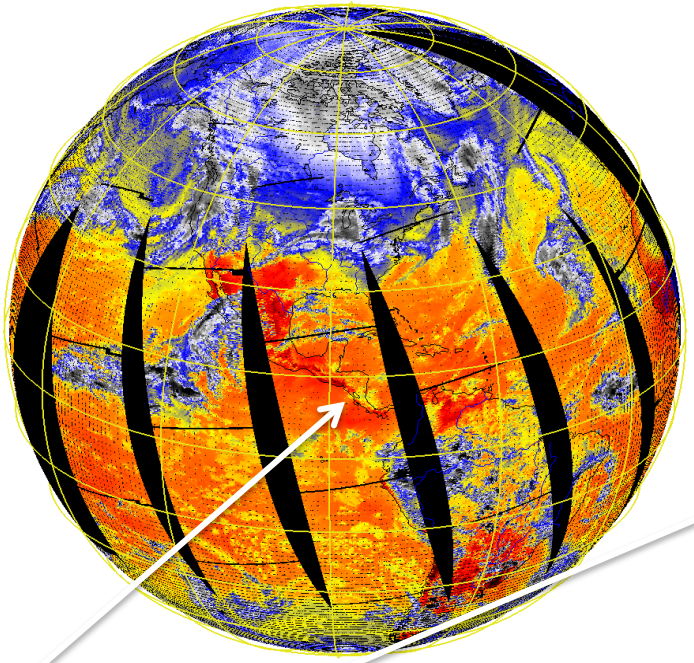
Total of 15 projects supported by JPSS with a strong NWS Theme

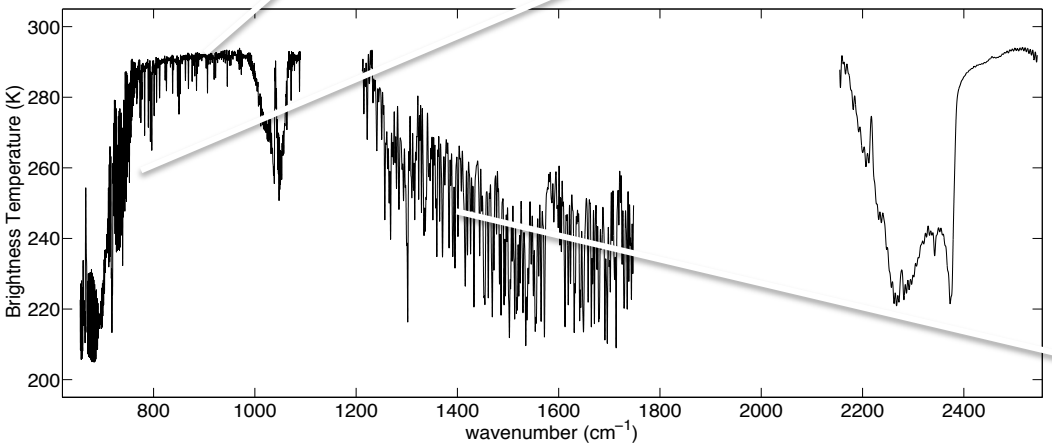
- ✓ Three tropical cyclone projects
  - ✓ DeMaria, Li, Weng
- ✓ One fire weather project
  - ✓ Csiszar (Evans/Justice – UMD)
- ✓ One precipitation project
  - ✓ Pingping Xie
- ✓ Blended SST
  - ✓ Harris
- ✓ Cryosphere
  - ✓ Key
- ✓ Three DNB/Imagery projects
  - ✓ Miller, Heidinger, Hawkins
- ✓ Two global data assimilation projects
  - ✓ Boukabara, Baker
- ✓ AWIPS demo projects
  - ✓ SPORT, (CIMSS, CIRA)
- ✓ Alaska Proving Ground
  - ✓ CIMSS
  - ✓ CIRA
  - ✓ SPORT
- ✓ CSPP Direct Broadcast support
  - ✓ Huang/Gumley/Strabala -CIMSS

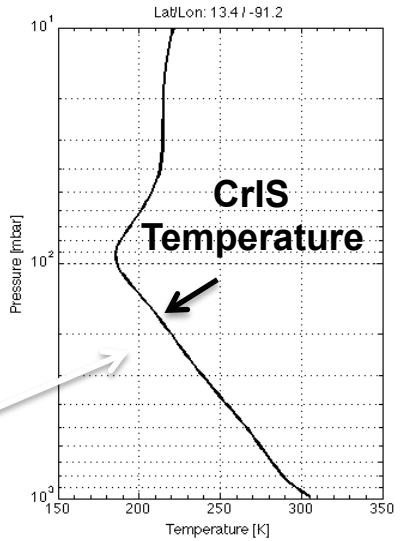
JPSS Proving Ground Projects are precursors to further work in NOAA testbeds

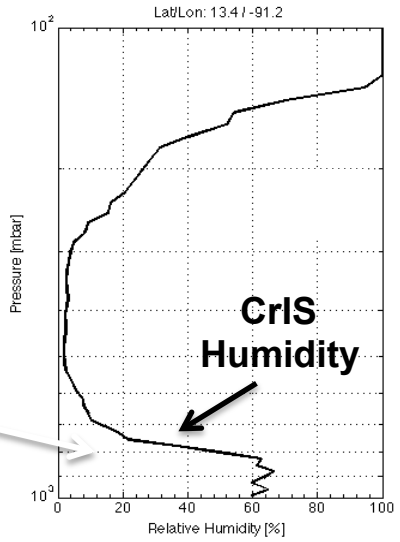
CrIS First Global Image – February 2012

This image is a "window" channel at 900 cm-1 wave number (or 11.1 microns) – it is sensitive to the Earth's surface and clouds. The second figure in the lower left is the spectrum of CrIS channels. The spectrum is used to derive the vertical temperature and moisture (humidity) information **needed by the National Weather Service to forecast weather**, both calm and severe, up to 5 to 7 days in advance.

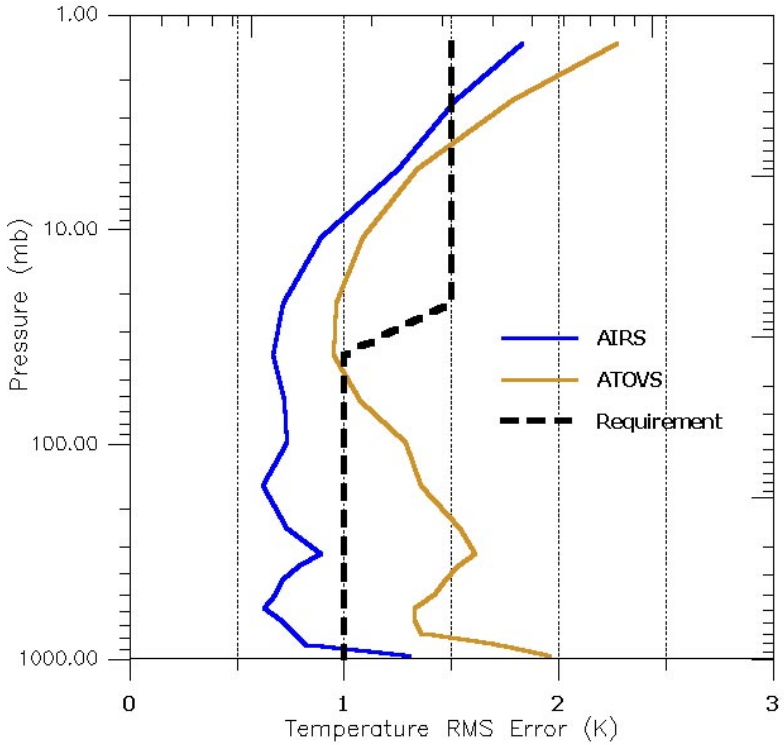


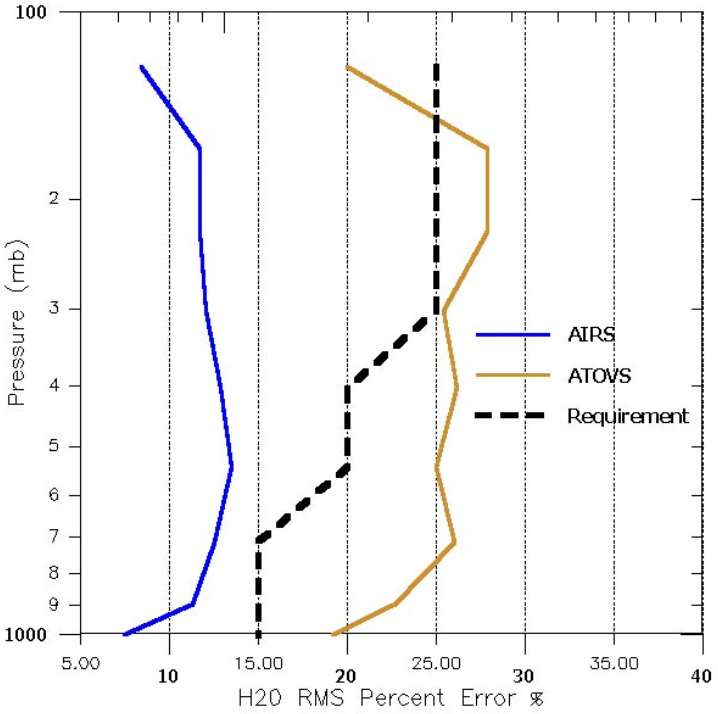






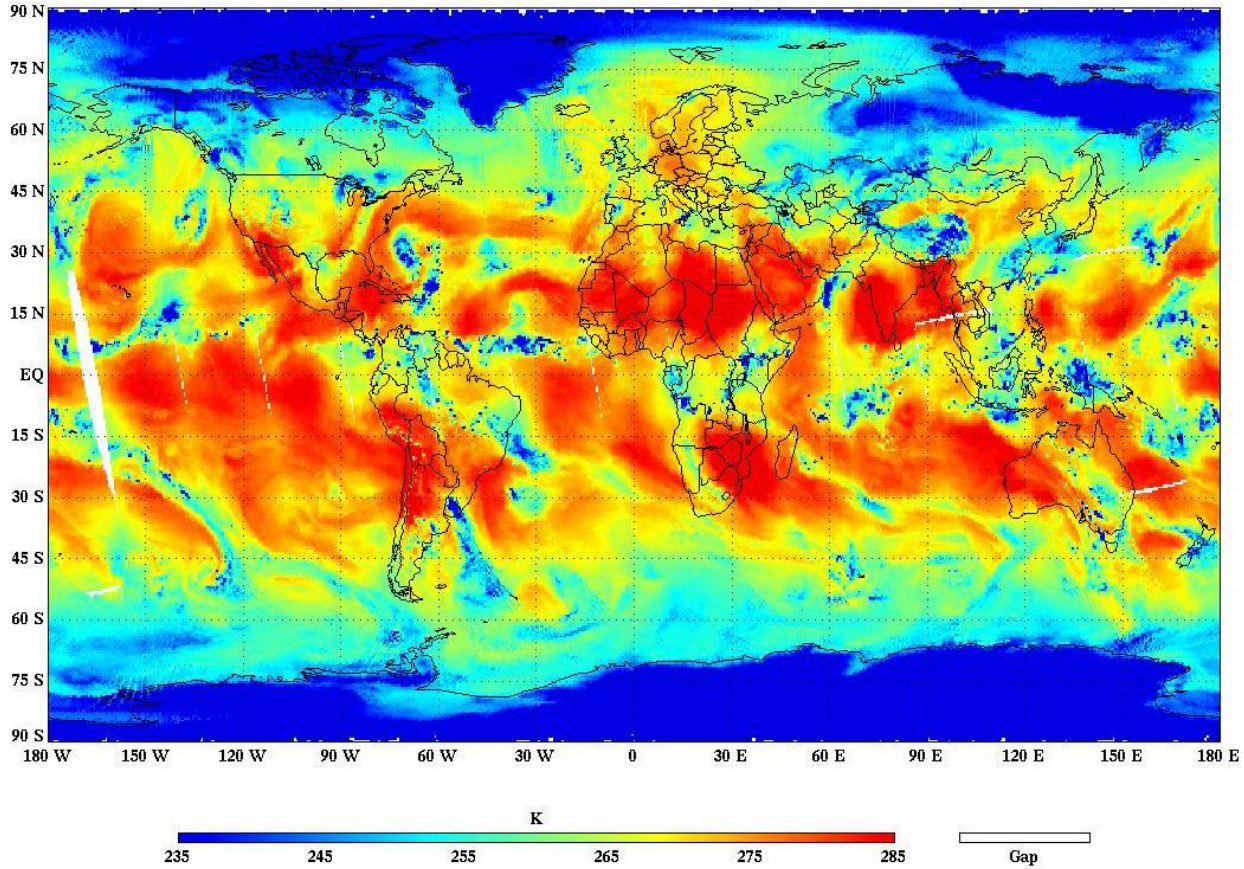
Significant Improvements in Soundings





- CrIS (AIRS as proxy) provides significant improvements in temperature and moisture soundings over older generation instruments
  - Vertical resolution has improved from 3-5 km to 1-2 km
  - Improves accuracy of forecasts

First global ATMS image showing the channel 18-microwave antenna temperature at 183.3 GHz on November 8, 2011



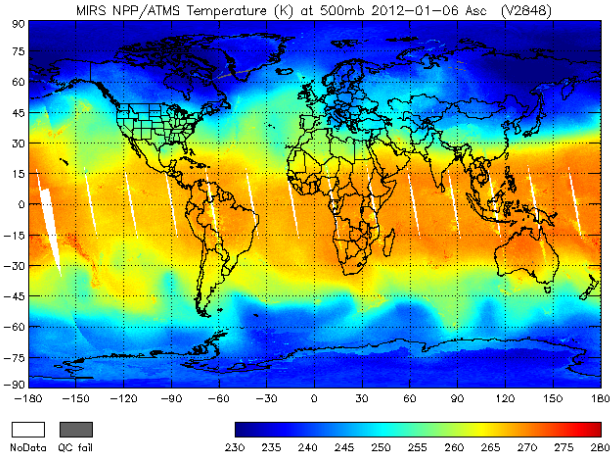
The ATMS data were processed at the NOAA Satellite Operations Facility (NSOF) in Suitland, MD and the image was generated by STAR

Quality of the image is superb, no indication of instrument artifacts, and by design no orbital gaps

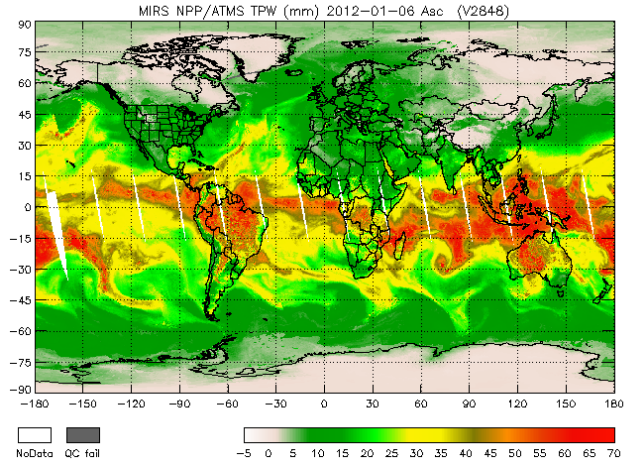
This channel measures atmospheric water vapor; note that Tropical Storm Sean is visible in the data, as the blue patch due to heavy precipitation, in the Atlantic off the coast of the Southeastern United States. *ATMS provides critical water vapor information for weather forecasting and storm intensity assessments*

Benefits
(NOAA ATMS MIRS Products)

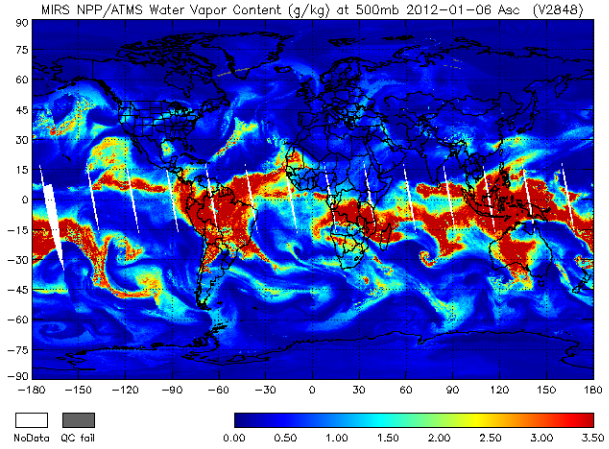
T



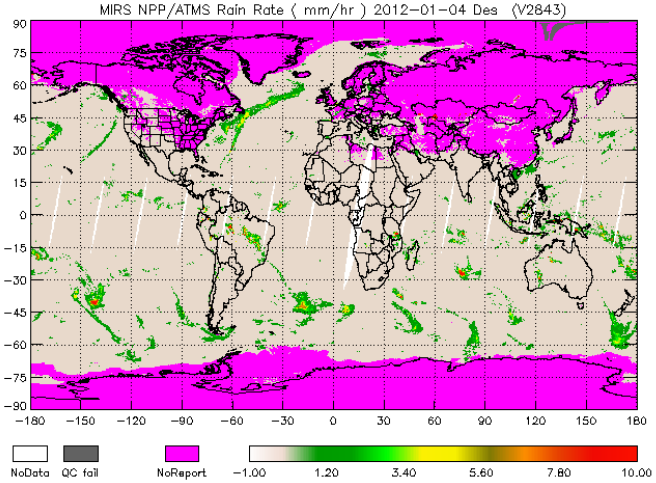
TPW



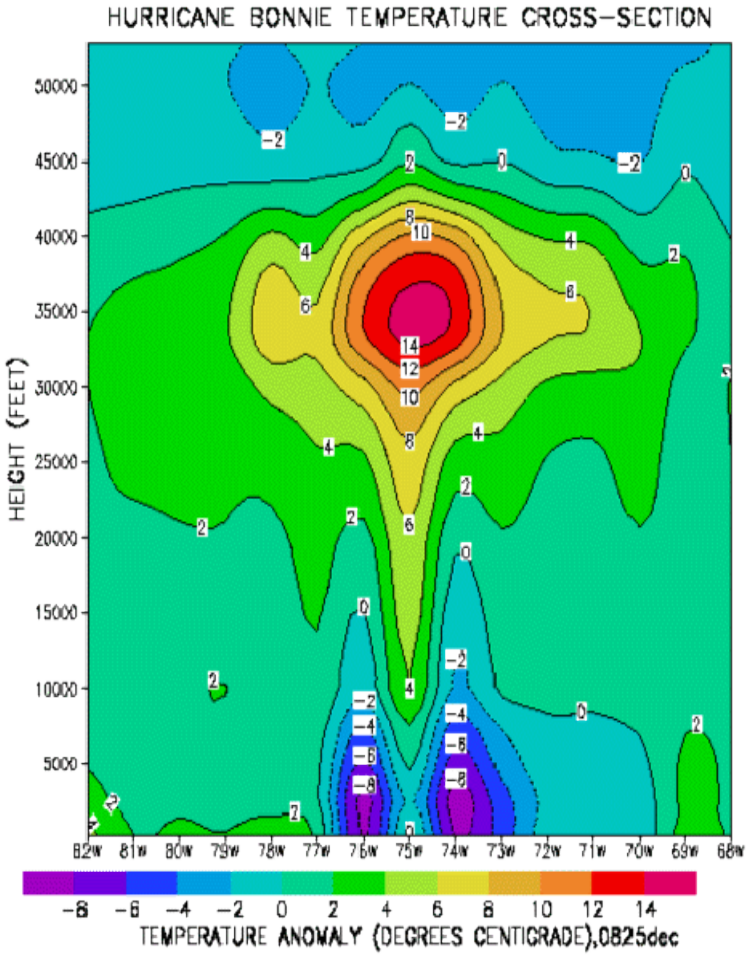
WV

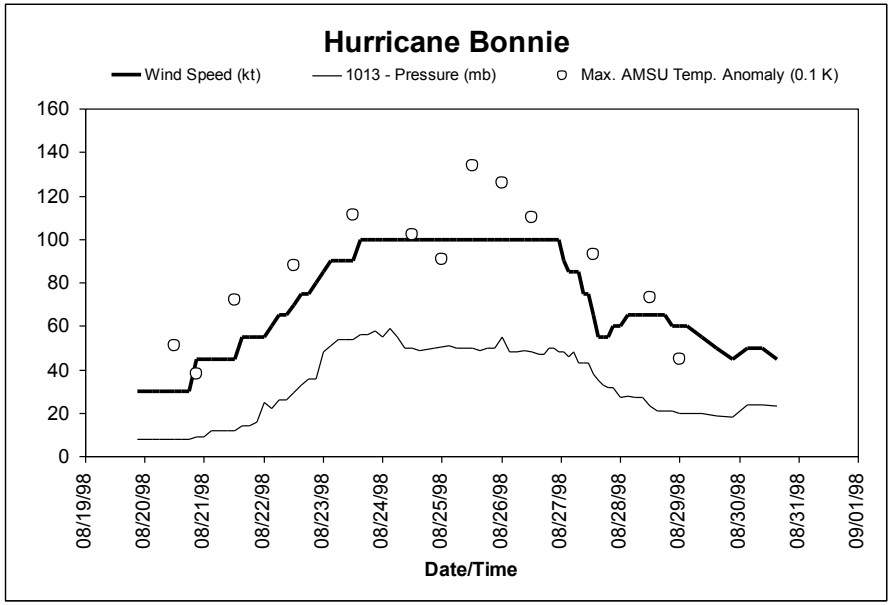


RR

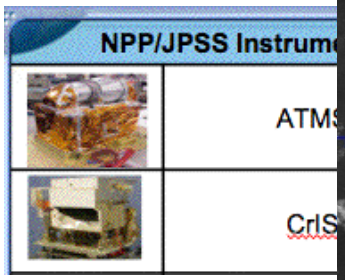


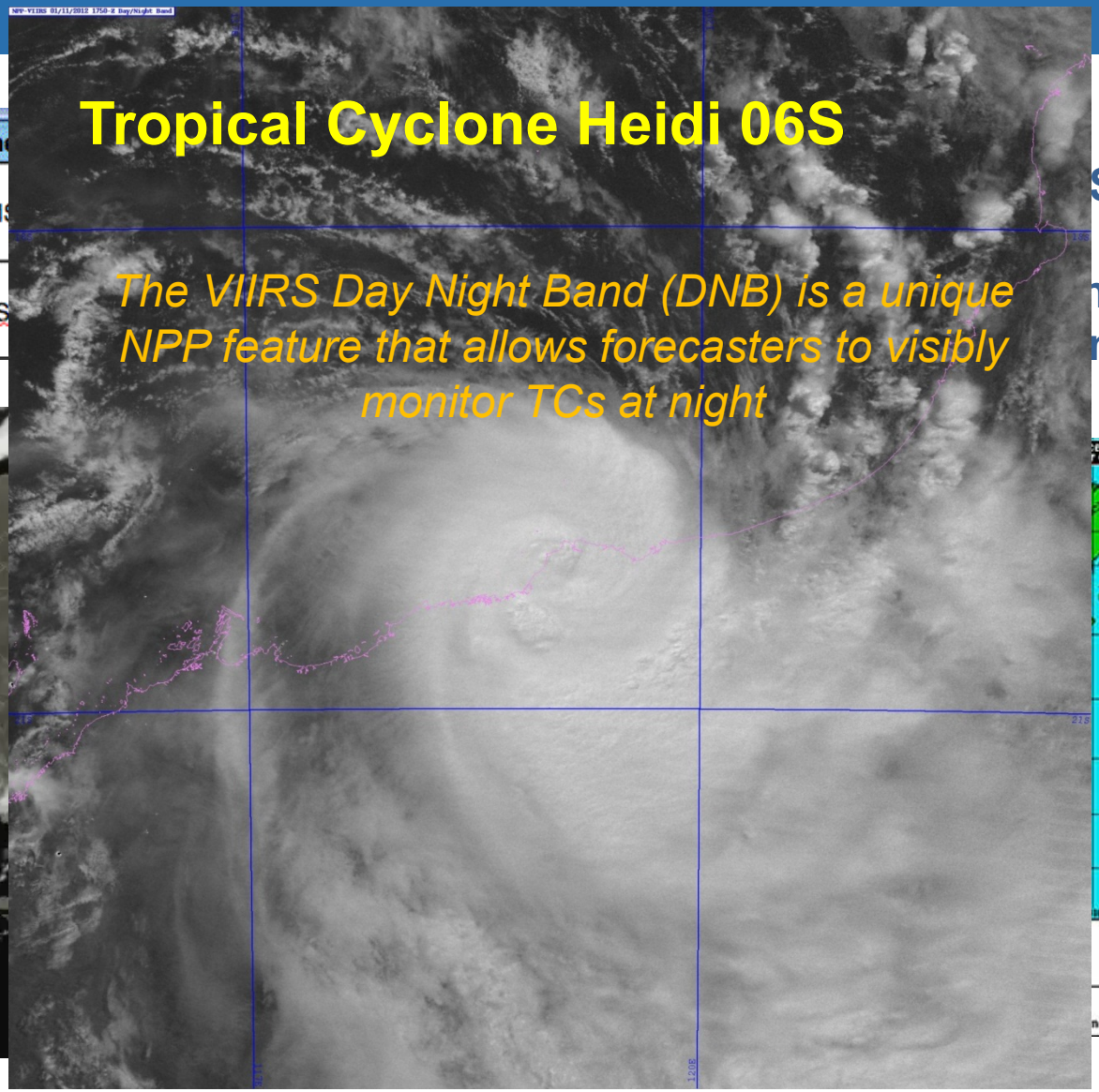
Soundings are used by NHC for Tropical Cyclone Strength Assessments





Weather Forecasting : JPSS Critical Mission





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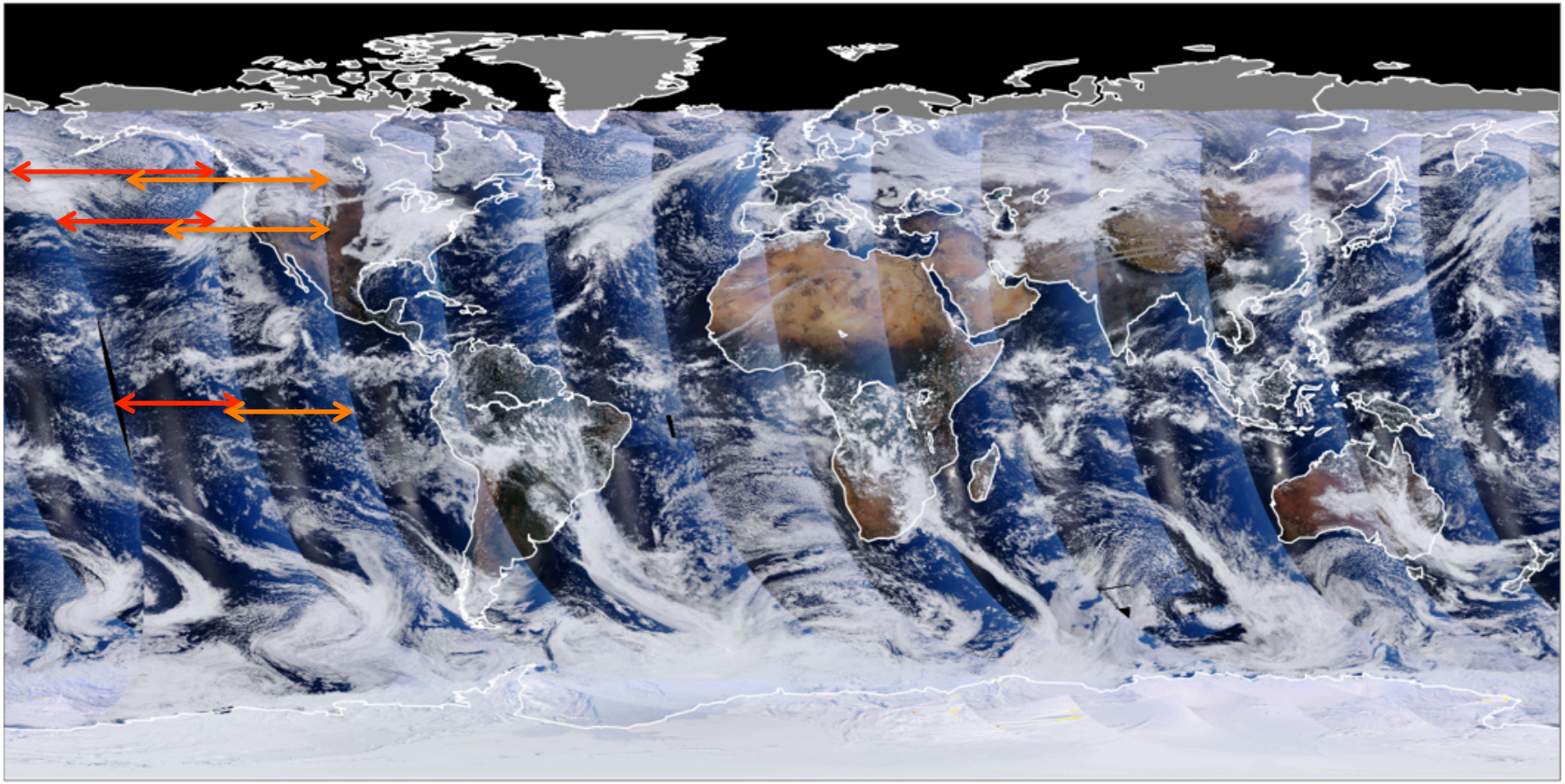
Forecasting PGRR Projects

- *JCSDA CrIS/ATMS Radiance Assimilation Experiments*
  - ✓ POCs – Sid Boukabara (NOAA), Nancy Baker(NRL)
  - ✓ Outcome - Impact assessments and improved utilization of radiances
- Mark DeMaria, J. Knaff (STAR) / Beven, Brennan (NHC), Fukada (JTWC) *Application of JPSS Imagers and Sounders to Tropical Cyclone Track & Intensity Forecasting*
- Jun Li / Jack Beven (NHC) *Near real-time assimilation system development for improving tropical cyclone forecasts with NPP/JPSS soundings*
- Fuzhong Weng /Vijay Tallapradaga (EMC) *Improve Hurricane Structure Monitoring and Intensity Forecast Using NPP ATMS and GCOM-W AMSR2*
- Pingping Xie (CPC) *Infusing JPSS Passive Microwave (PMW) Precipitation Retrievals to CMORPH Precipitation Estimates for Improved Weather, Climate, and Water Applications*

VIIRS – the workhorse for environmental assessments



VIIRS RGB (True Color), 20111122

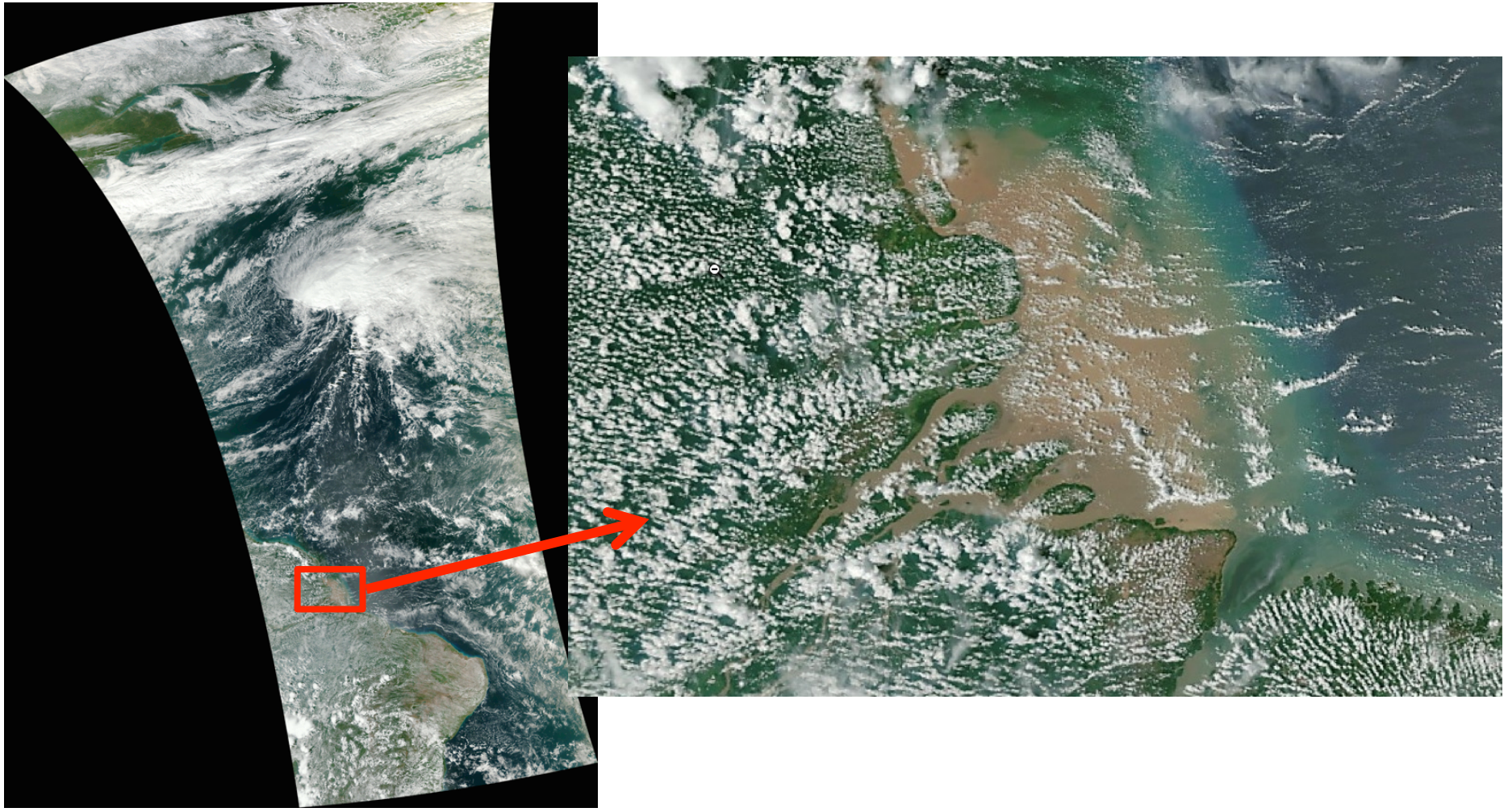
R : M05 (0.672 μm); G : M04 (0.555 μm); B : M02 (0.445 μm)

Creation date: 2011-11-26 07:19:26 Z

VIIRS related PGRR projects

- Demonstration of VIIRS fire products for 2012 Fire Season
- Demonstration and utilization of NPP products at Alaska's Weather Forecast Offices.
- Demonstration and utilization of ocean color products by NOS and NMFS.
- Demonstration and utilization of cryosphere products at the National Ice Center.
- Demonstration of the Day-Night Band
- Level-4 Blended High Resolution SST

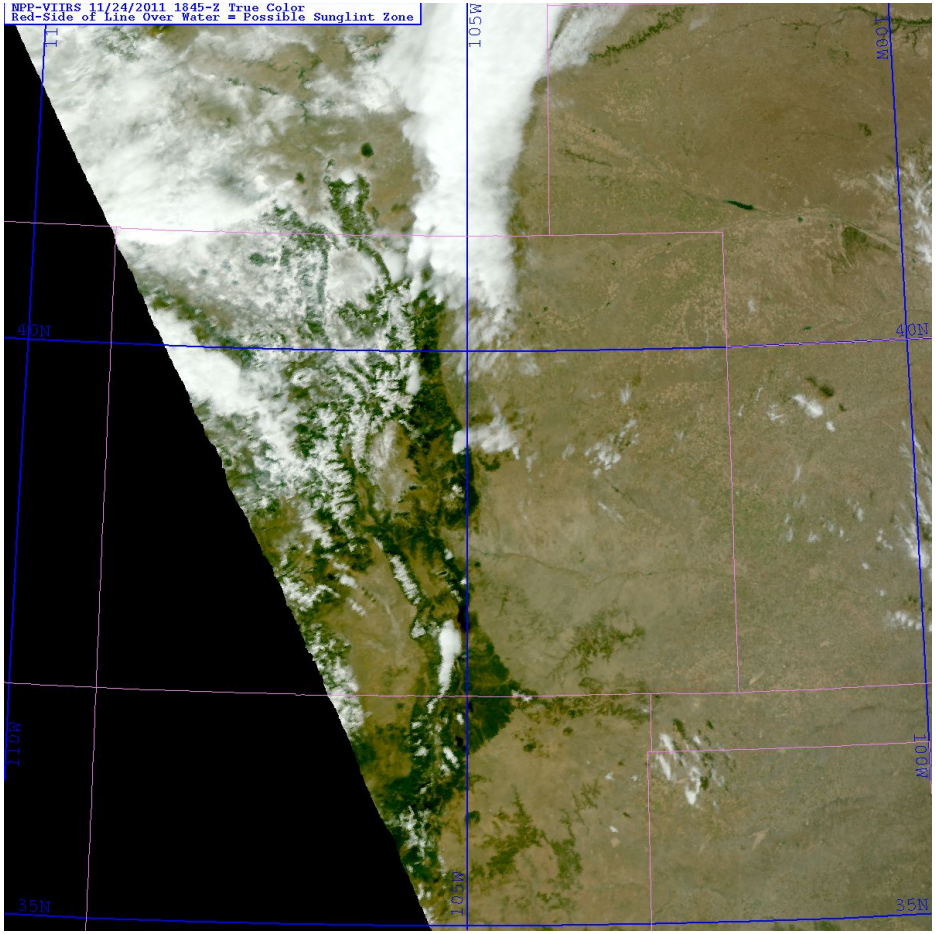
First VIIRS Imagery from NPP



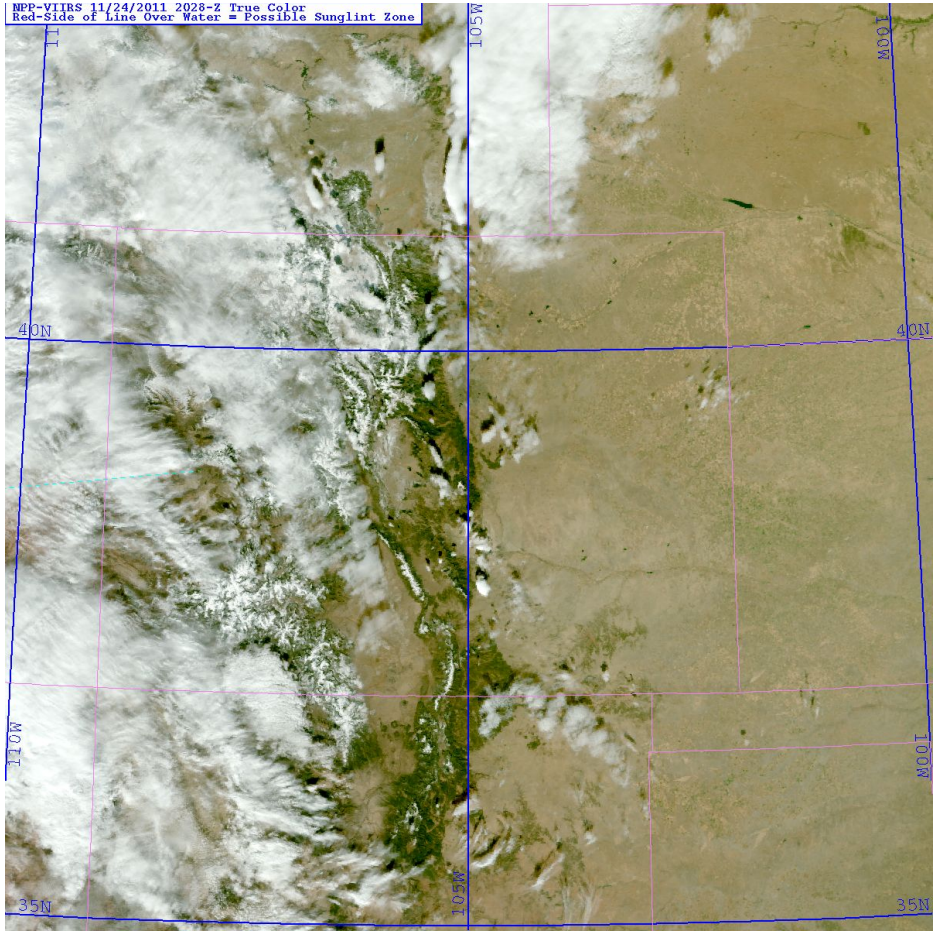
NPP VIIRS True Color Examples (NRL & CIRA)

Colorado

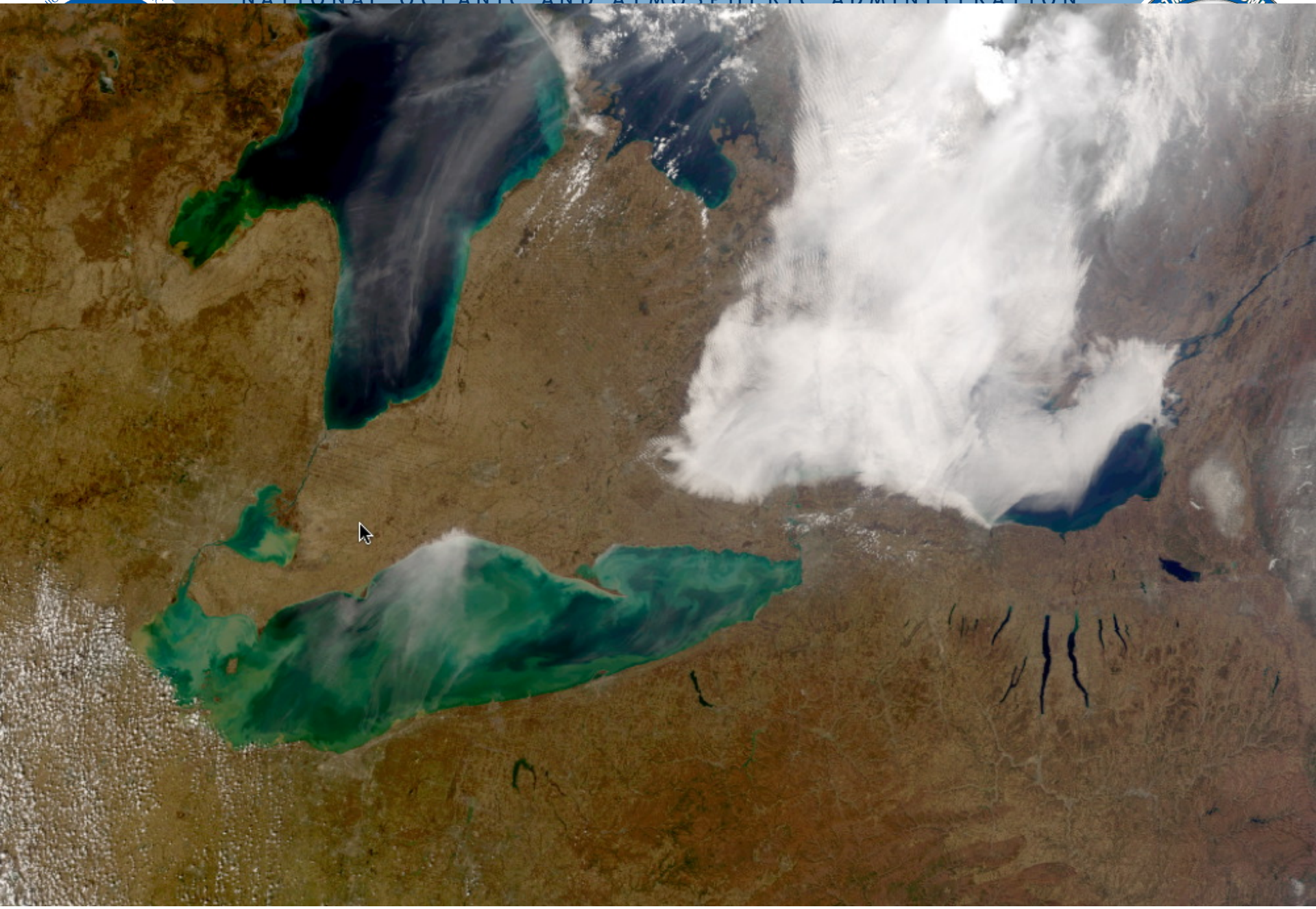
11.24.2011 1845 Z, Near Edge of Scan



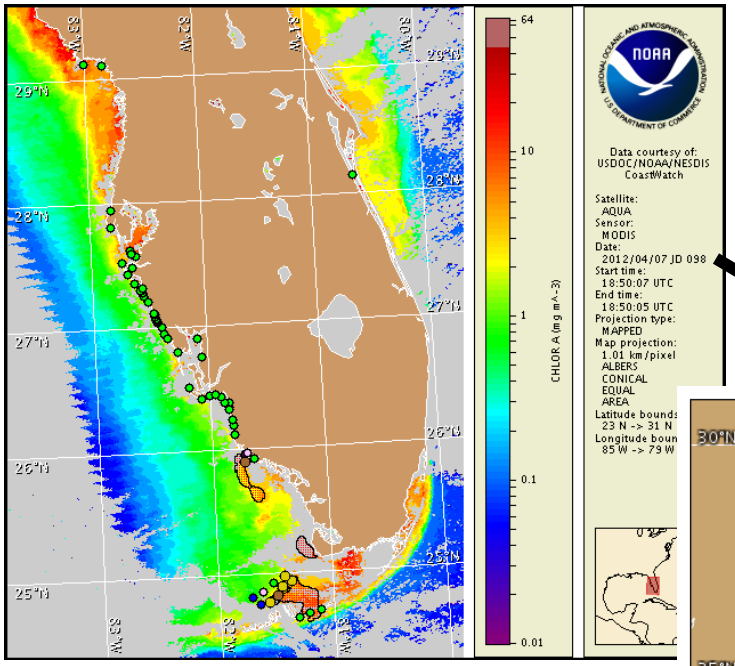
11.24.2011 2028 UTC, Near Nadir



→ VIIRS maintains similar spatial resolution quality at edge of 3000 km swath



JPSS Supporting NOAA Operational Harmful Algal Bloom Alerts



Operational Conditions Reports

Southwest Florida

Monday, April 30, 2012

A patchy harmful algal bloom remains offshore of the gulfside region of the Lower to Middle Florida Keys. Patchy very low impacts are possible tomorrow through Wednesday, with moderate impacts possible today. No additional impacts are expected alongshore southwest Florida today through Wednesday, May 2.

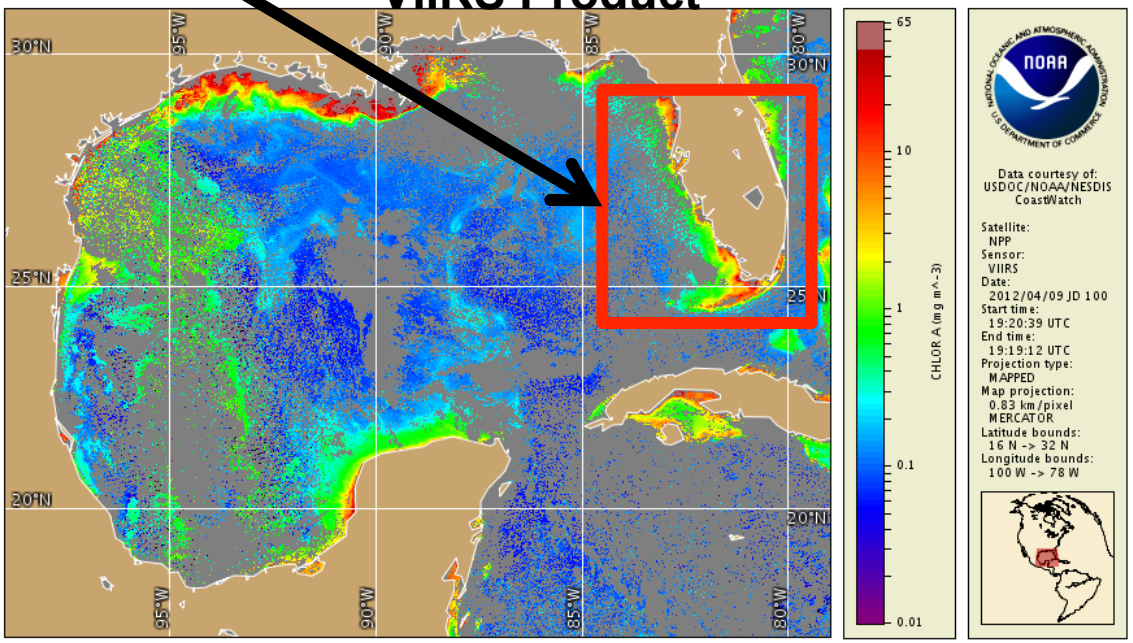
Northwest Florida

Monday, April 30, 2012

There are currently no reports of harmful algae in this region. No impacts are expected. Last report: Tuesday, March 01, 2011

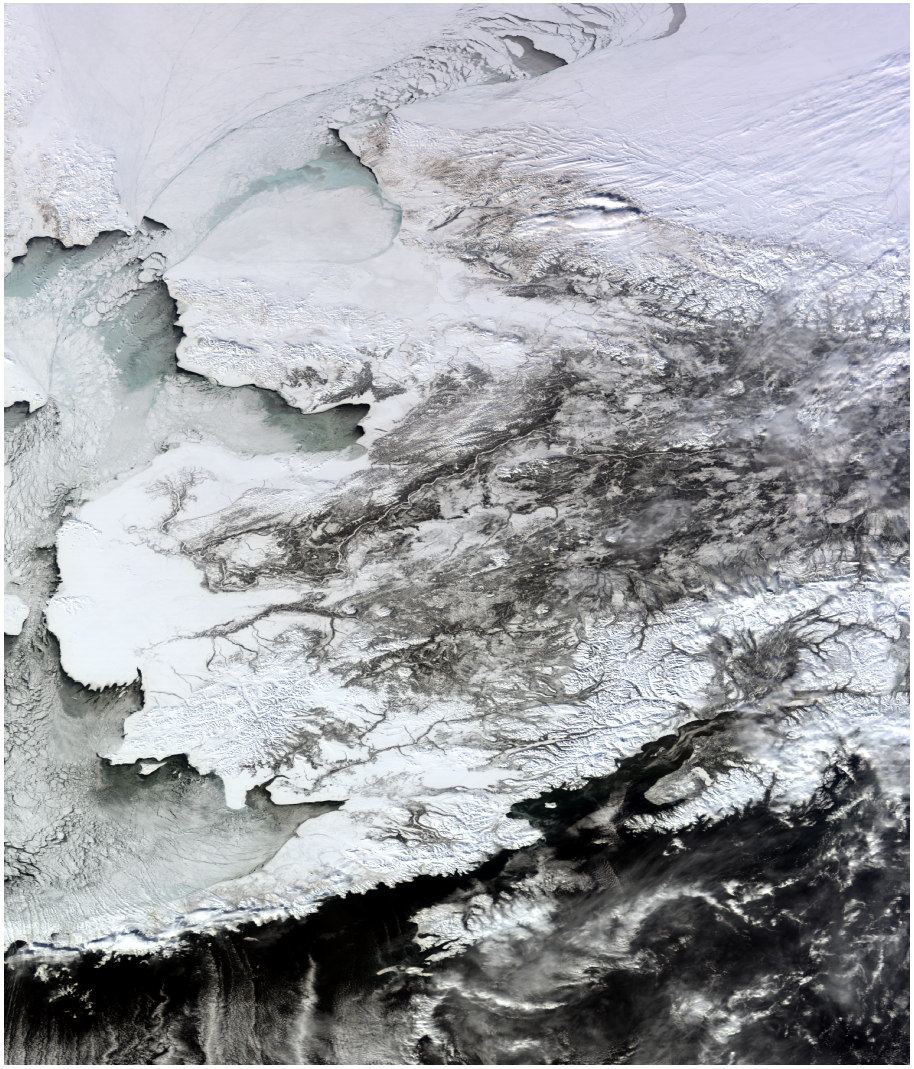
East Florida

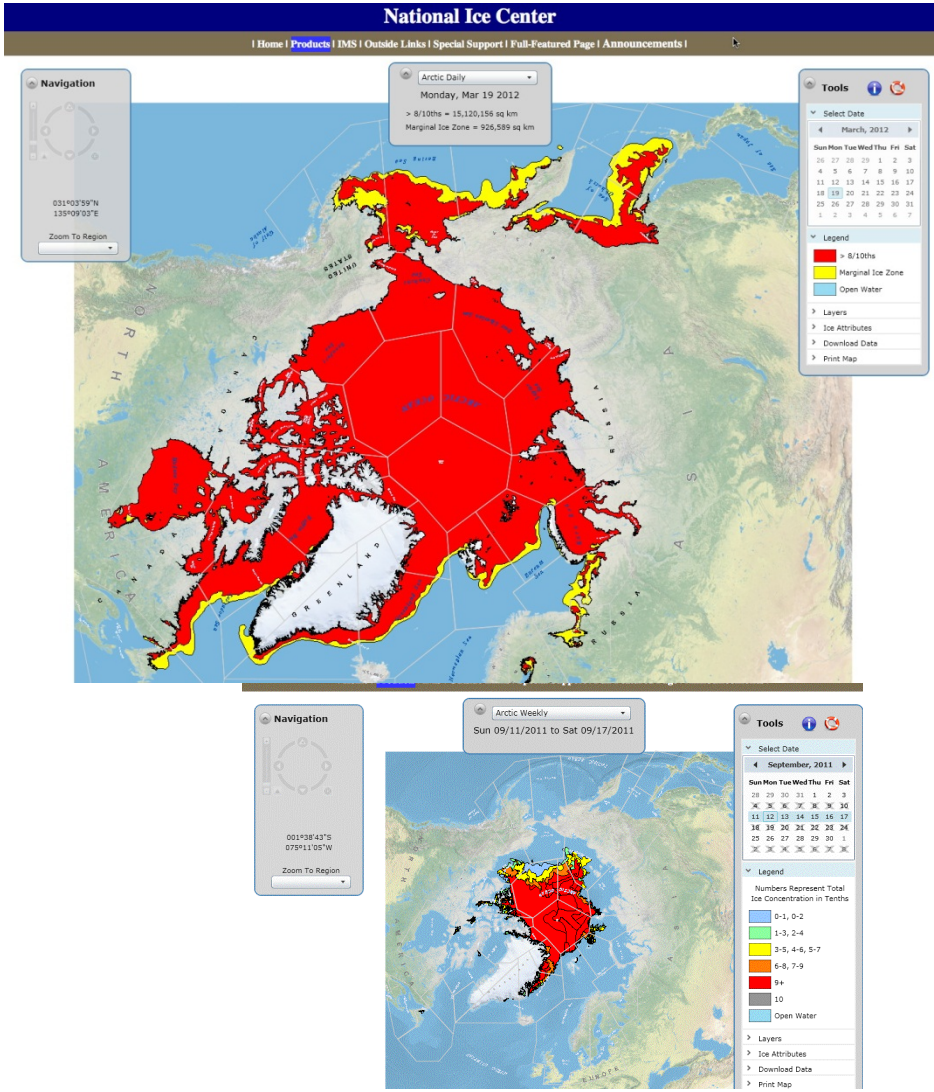
VIIRS Product



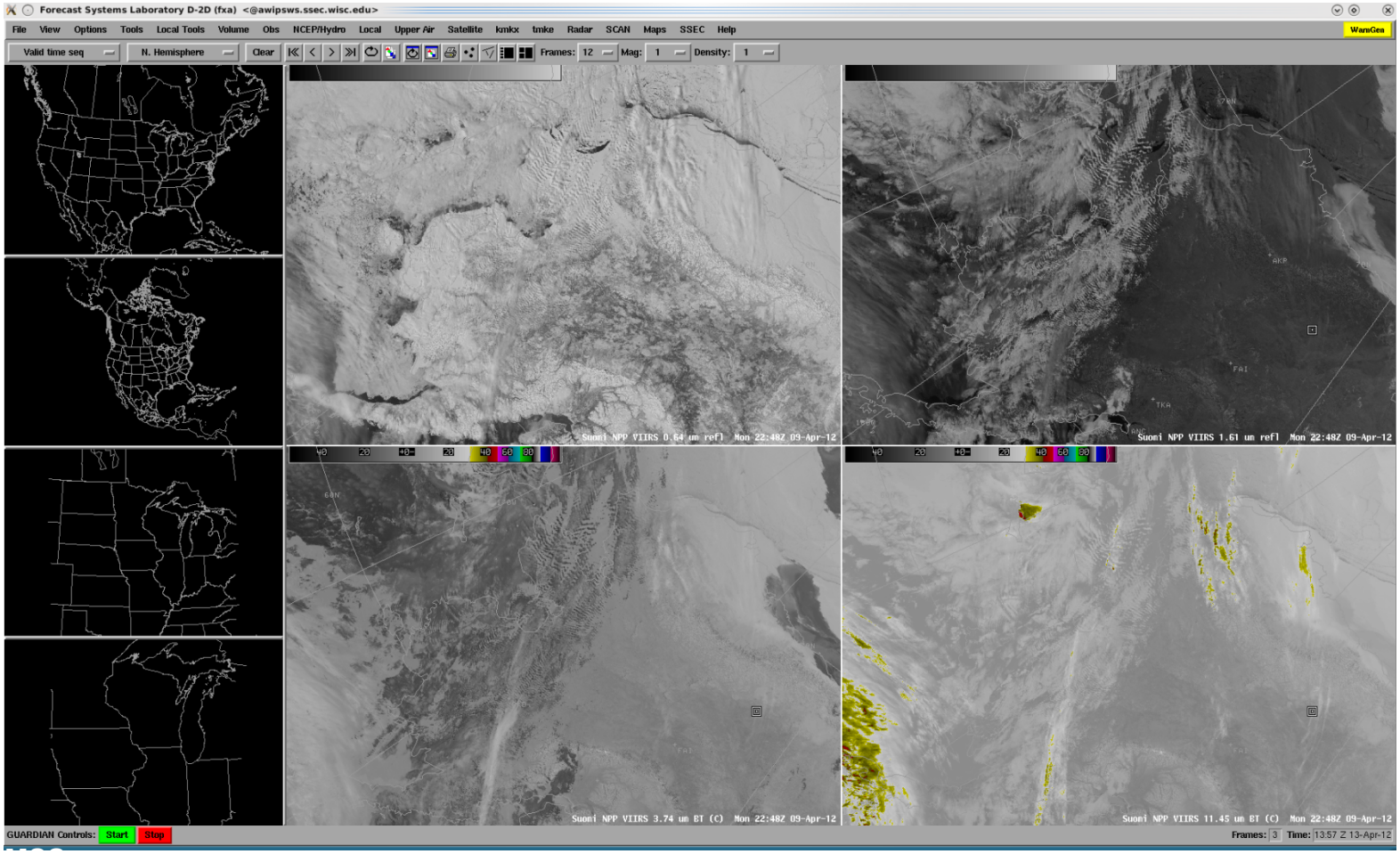
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

VIIRS provide Ice and Snow information for the National Ice Center

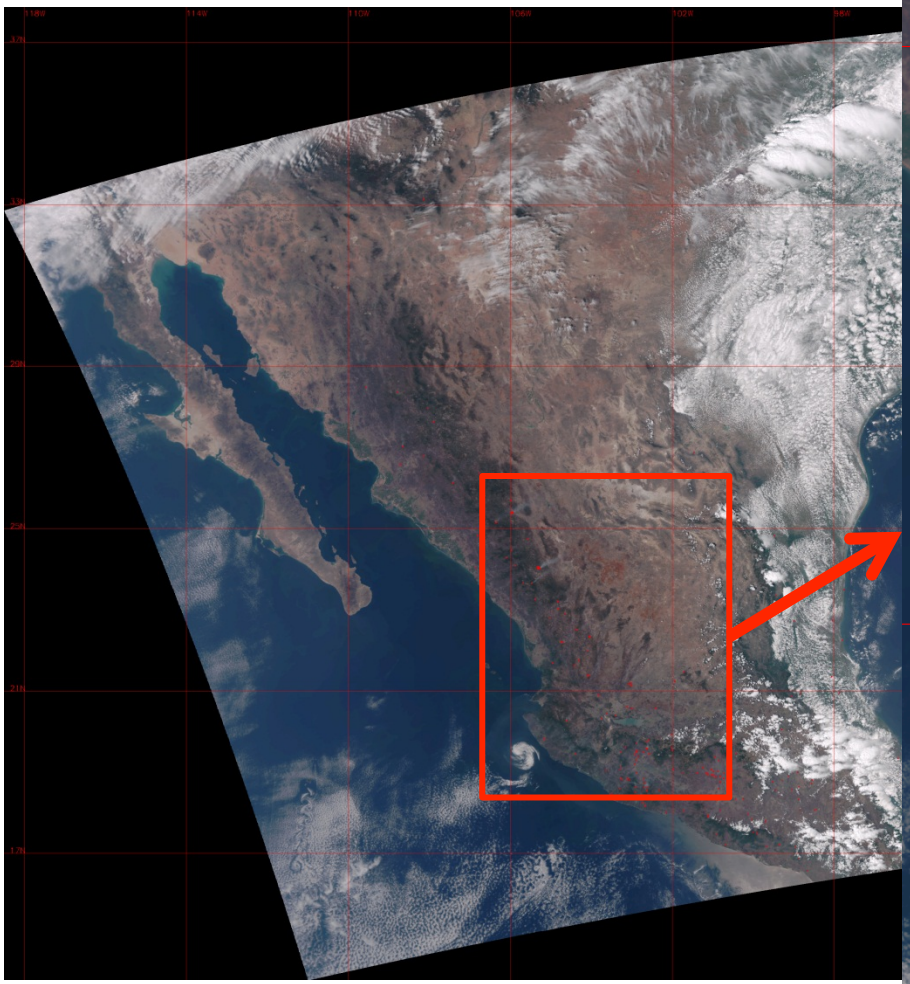


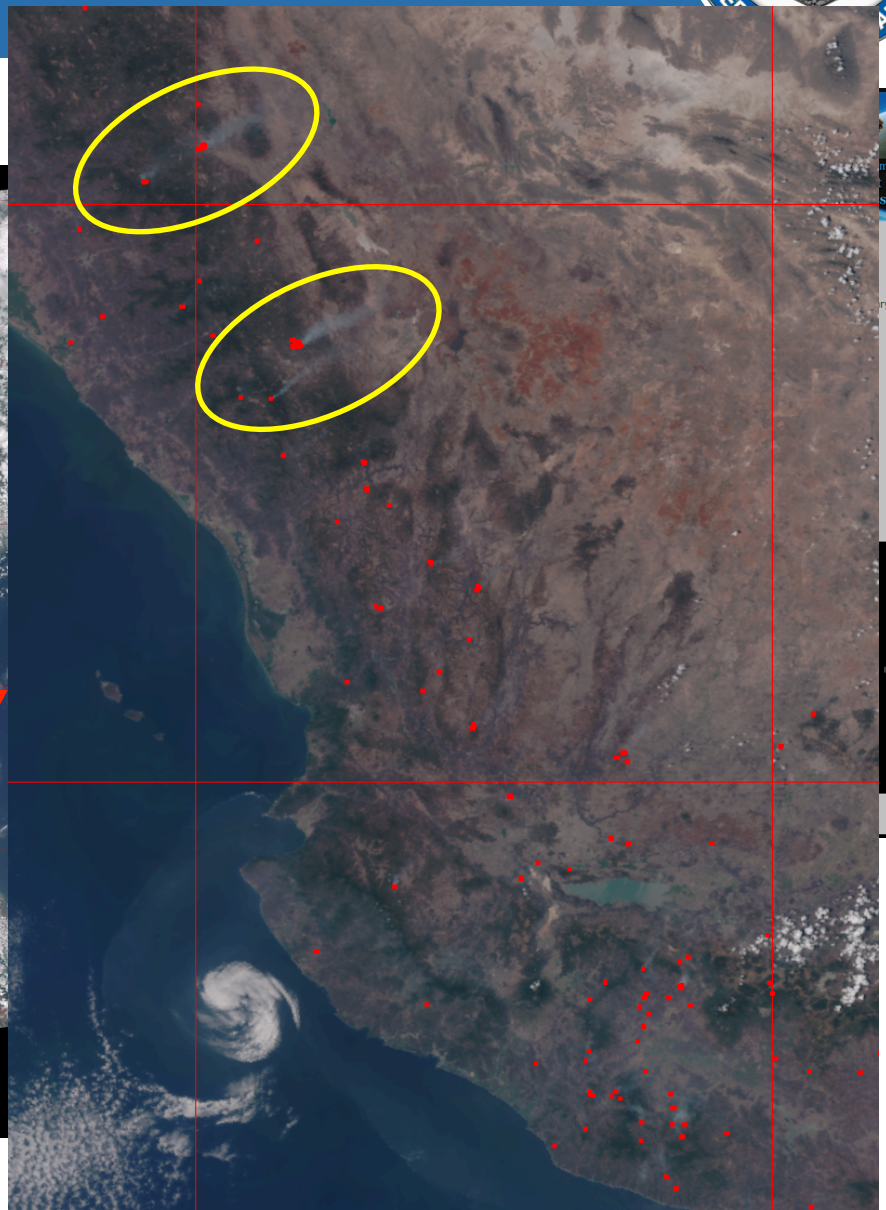


VIIRS Data for Alaska in AWIPS demo: 9 April 2012 22:48 UTC



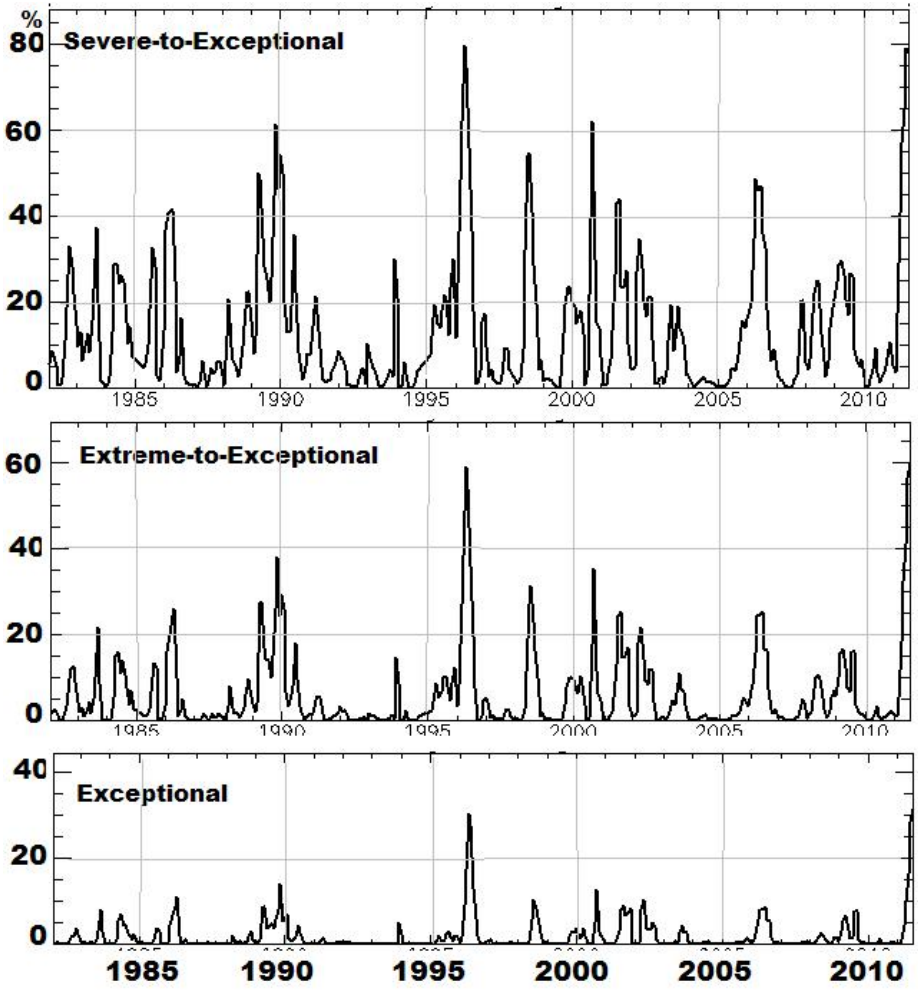
VIIRS Active Fires





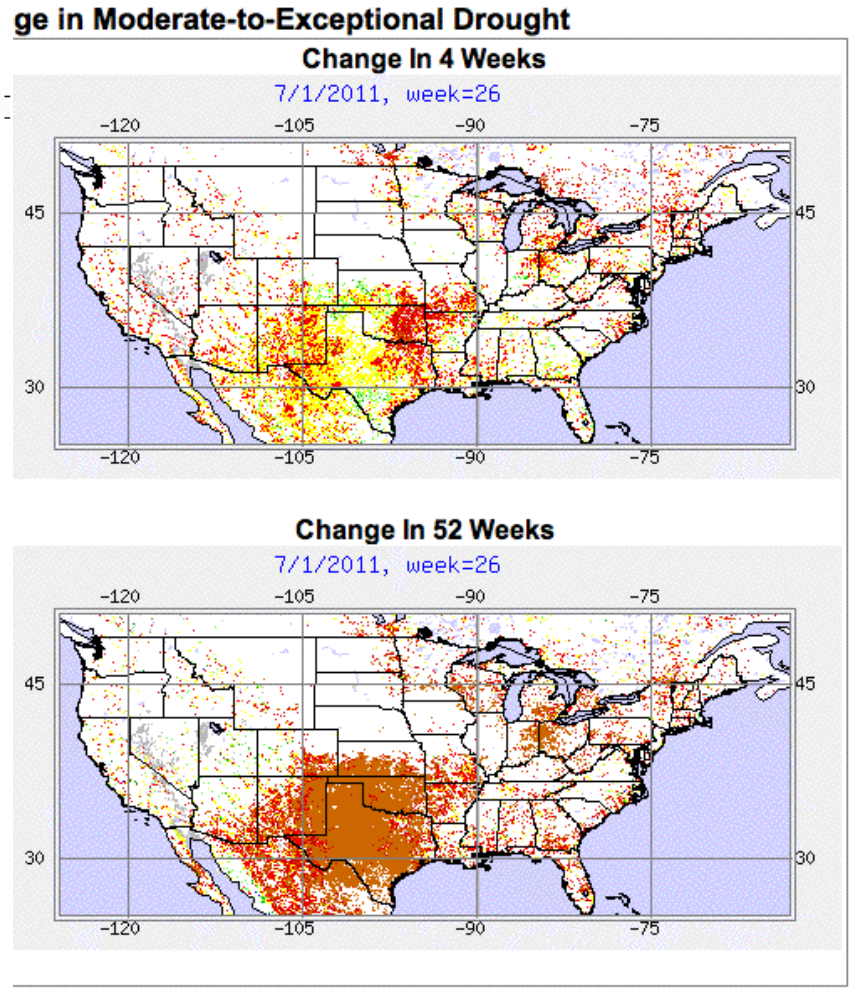
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

2011 TEXAS Drought Assessment using AVHRR (replaced by VIIRS)



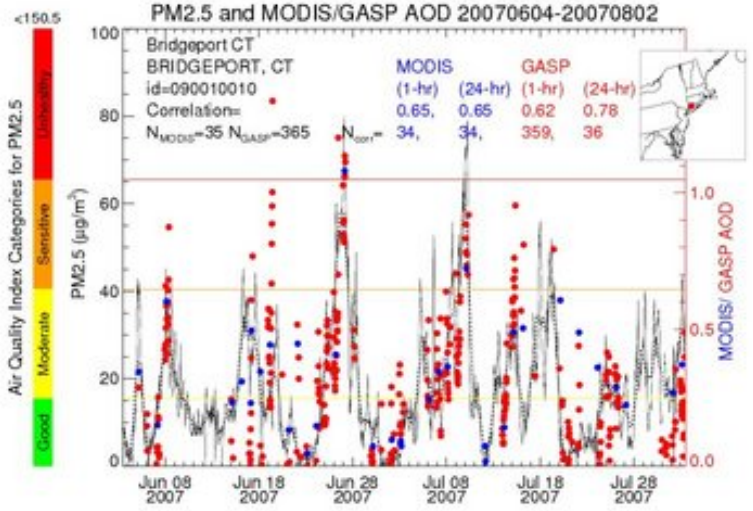
Percent drought area, Texas, USA

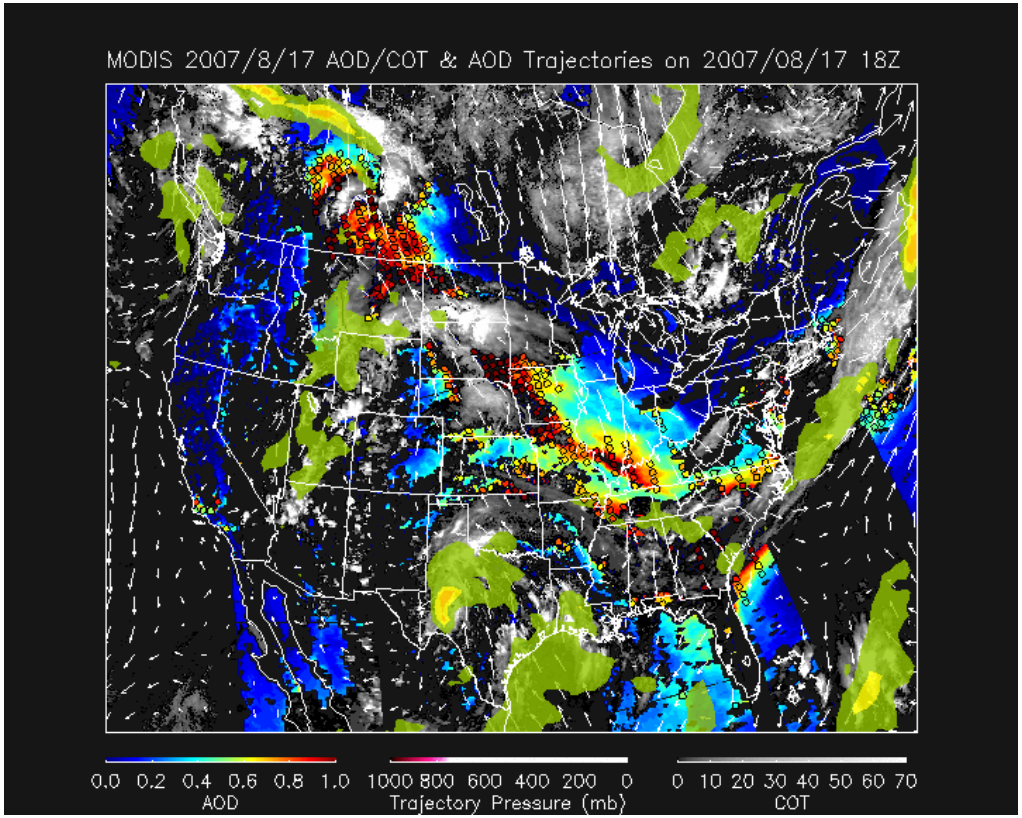
From AVHRR 1981-2012 data



VIIRS provides continuity for Air Quality applications

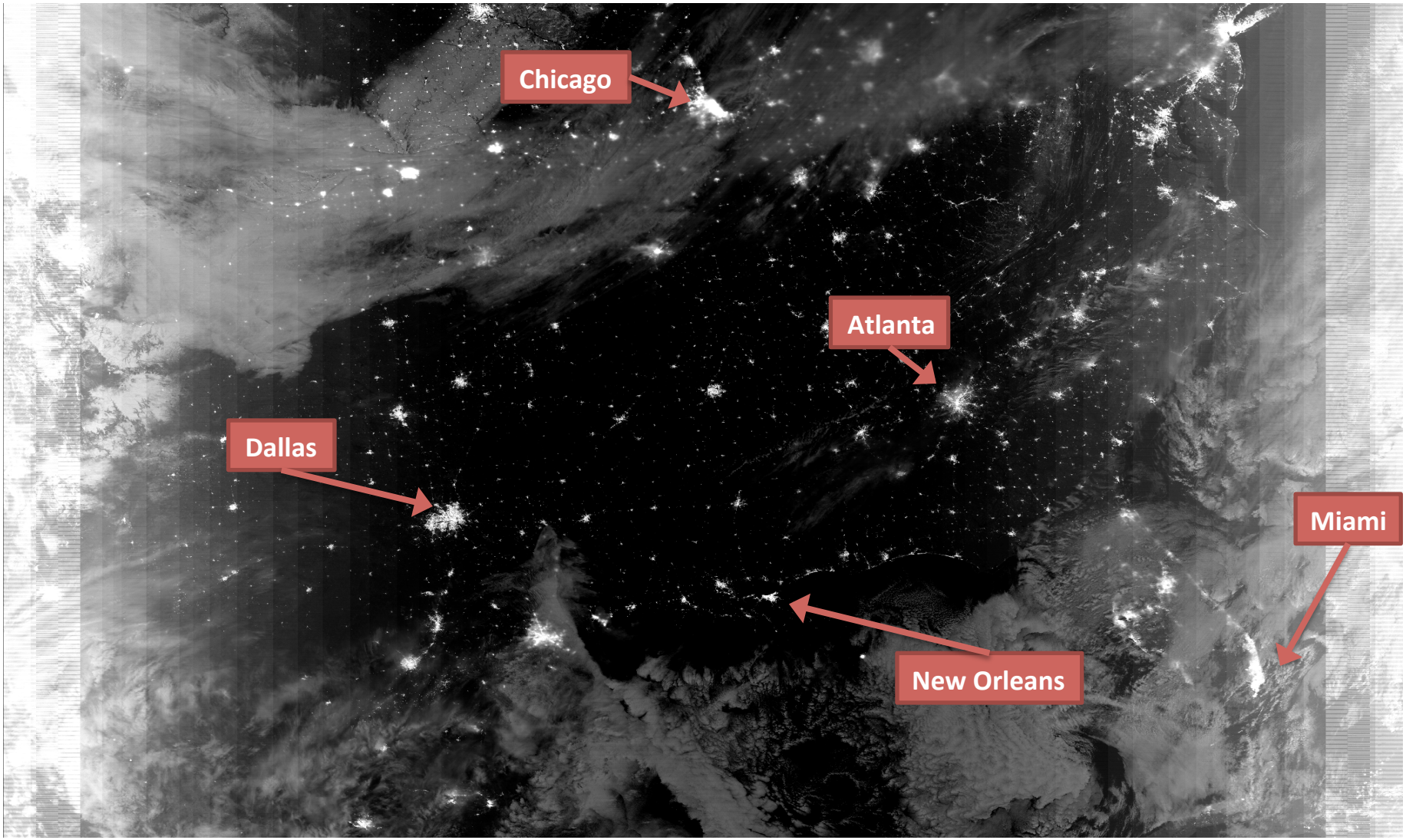
Integrated observations, products and synthesis to support air quality forecasters





NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

VIIRS Day Night Band



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Volcanic Ash

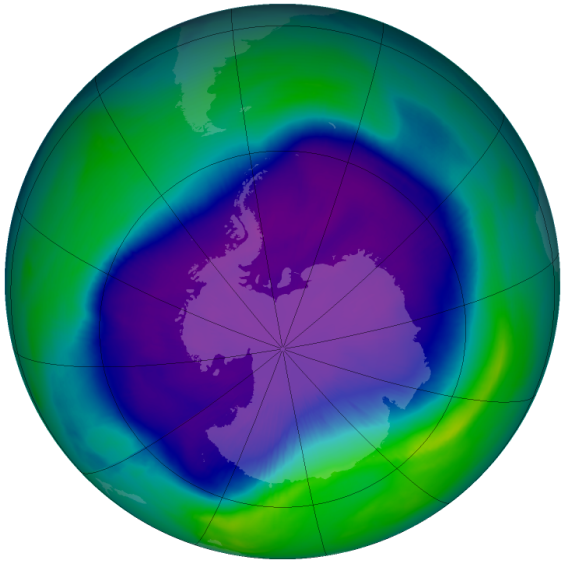
Puyehue-Cordon Caulle Volcanic Chain, Chile
12-13 Dec 2011

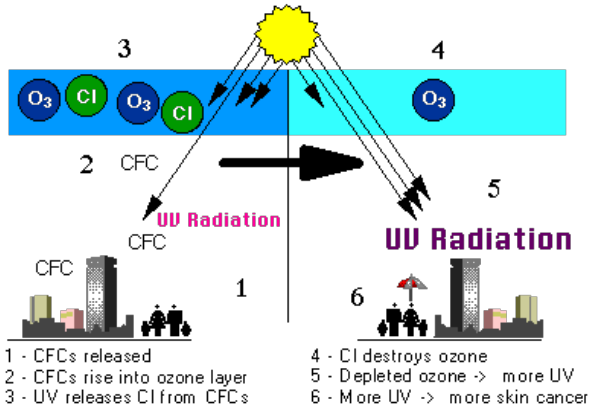
Afternoon

Night

Courtesy of NRL and CIRA

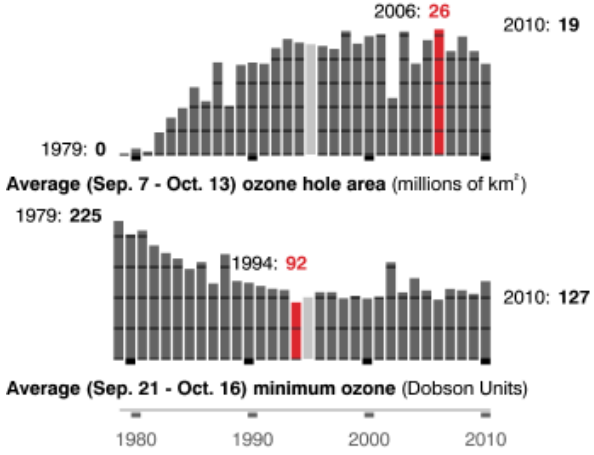
OMPS provides continuity of essential ozone products and applications

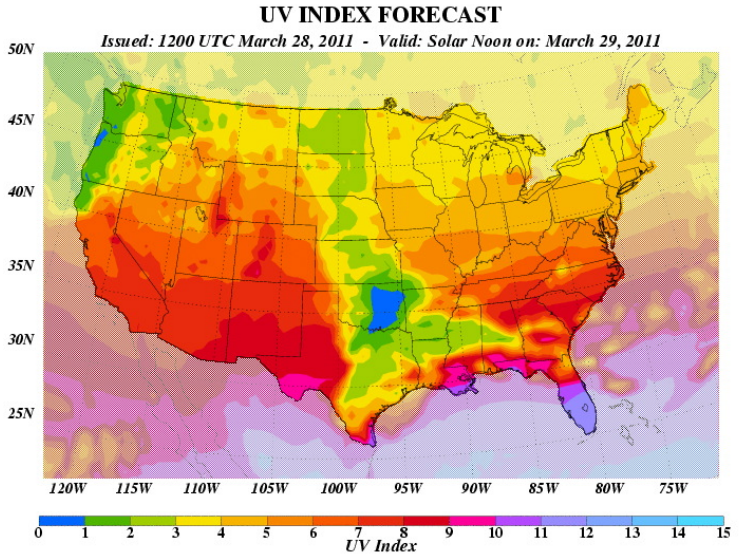




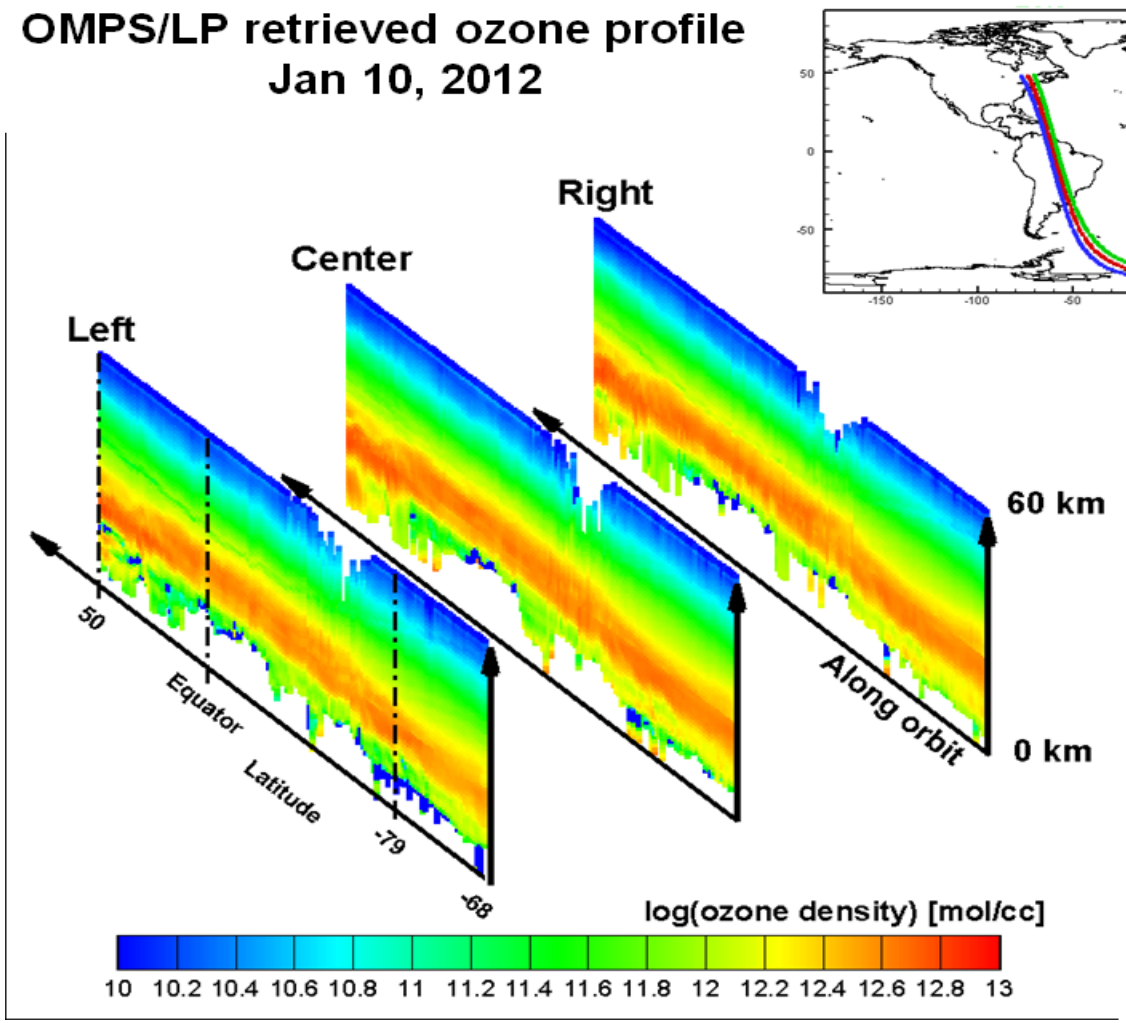
Monitoring ozone hole and recovering of ozone due to the Montreal Protocol for eliminating Chlorofluorocarbons (CFCs)

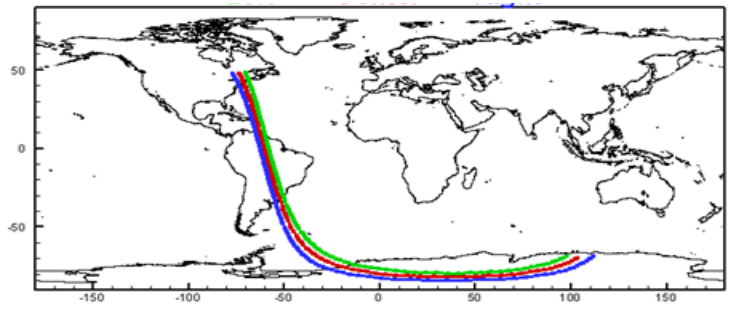
Used in NWS UV Index forecast to allow public to avoid overexposure to UV radiation

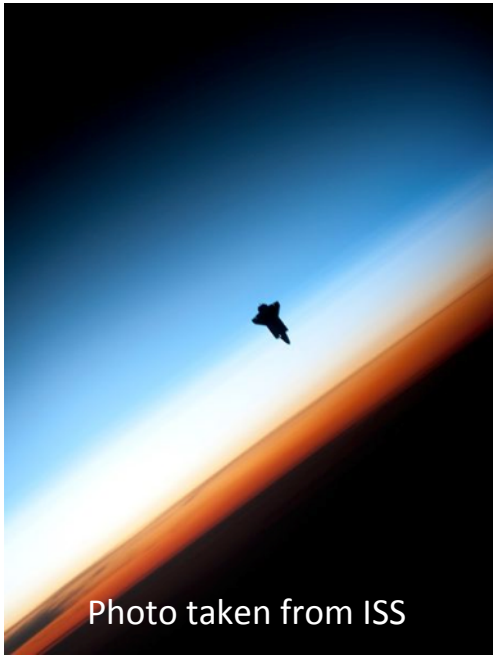




Ozone Profile and OMPS Limb







Conclusions

The Proving Ground is focused on user readiness and improved utilization of satellite data for key operational and research product and services

NESDIS delivers the satellite data, and the other NOAA line offices provides the value added applications for the public and decision makers.

So it is vital that we work together to improve products and services by improving data utilization.

GOES-R and JPSS are working together in the Satellite Proving Ground effort.